them came a Celtic, and finally a Gothic invasion. As Scandinavian archæology grew into a science, and the remains discovered were seen to fall into a stone, a bronze, and an iron series, the three groups collected were, in obedience to the previously existing historic theory, respectively labelled Finnish, Celtic, and Scandinavian. Now, it happened that the first *two* obviously prehistoric skulls found in Scandinavia were of the round type, on which circumstance a learned person (Retzius, if I remember rightly), jumped—in characteristic nineteenth-century style—to the conclusion that the *whole dolmen race* was round-skulled. Never was a more monstrous generalisation built on a miserable collection of two particulars. There are known to exist in museums about 80 skulls attributed to dolmen men, some of which are, perhaps, of questionable origin. These crania are of every conceivable type, being, in fact, identical with modern churchyard skulls. No one pretends that their form is short, or Celtic, or Finnic; and some authorities allege that they are mostly long. These facts are notorious enough in the North. They were ventilated at the late Copenhagen Archæological Congress, and it was not denied on any side that the stone age skulls would suit modern Danes and Swedes. The short skulled stone man is in fact gone the way of the basilisk and the Vital Force, and it is time for him to take his departure from the authoritative scientific teaching of Great Britain.

Professor Huxley appears to believe that the Northern Bronze, or Iron Man, was long skulled. Although this view is quite unsupported by facts, it may be backed by an argument from the domain of the Higher Criticism. In the Museum of Rosenberg are casts of the so-called Gold Horns, the originals of which precious runic articles were stolen nearly 70 years ago. One of these horns bears the inscription—"Ek hleva gastim holtingam horna Favido," which every runologist can read easily enough. But no two runologists agree even approximately in their versions, so that no date can be given to the horns from inferences built on the style of the inscription. However, Professor Steenstrup has pointed out that some figures of men engraved on the horns have heads of a longish appearance, which conclusive fact tells in favour of Professor Huxley's dolicephalous doctrine, although some learned Danes consider that the skulls represented on the horns were obviously Oriental and not Scandinavian.

According to the highest Copenhagen authorities, there is no ground whatever for the assertion that modern Scandinavian skulls are of the long type. It is equally incorrect to say that Scandinavians are fair-haired and blue-eyed

Copenhagen G. STRACHEY

The Anglo-Saxon Conquest

IN an interesting paper, quoted at p. 661 of NATURE, Prof. Rolleston dwells upon the proportion of short-lived male skeletons, found in Anglo-Saxon interments, as contrasted with the older character of the Romano-British interments, deducing therefrom a conclusion as to their respective longevity. The writer appears to have forgotten that the youth of Romano-Britain had for many generations been forcibly expatriated—drafted abroad to feed the armies of Imperial Rome. A. HALL

Analogy of Colour and Music

MR. W. S. OKELY accuses me of having criticised his letter "far too hastily," and writes that he does *not* compare the *diameters* of Newton's rings with one another, but their *cubes*. On referring to his letter in NATURE for Feb. 10, I read as follows:—"Professor Zannotti, of Naples, gives for the *diameters* of the rings from red to red, the cube-roots of the numbers 1, $\frac{8}{9}$, $\frac{5}{6}$, $\frac{3}{4}$, $\frac{2}{3}$, $\frac{3}{5}$, $\frac{9}{16}$, $\frac{1}{2}$. The intervals between these, taken successively, are $\frac{9}{8}$, $\frac{16}{15}$, $\frac{10}{9}$, $\frac{9}{8}$, $\frac{10}{9}$, $\frac{16}{15}$, $\frac{9}{8}$." Your readers can now judge whether my failure to apprehend Mr. Okely's measures was due to my undue haste or his obscurity of expression. When Mr. Okely speaks of my "doubting the accuracy" of Professor Zannotti and M. Biot, he is drawing entirely on his own imagination; what I *did* doubt was the value of the deductions drawn by Mr. Okely from their figures. I *now* doubt his power of distinguishing between external facts and those evolved from his own moral consciousness.

Trin. Coll. Cambridge, May 4 SEDLEY TAYLOR

Colour of the Sky

YOUR correspondent "H. A. N." will find some interesting remarks on the blueness of the sky in Professor Tyndall's "Glaciers of the Alps" (p. 257, &c.), and one or two additional notes in my "Alpine Regions," p. 150. With regard to the colour of the sky at great heights, I can inform him that in fine weather the blue becomes deeper as one ascends, as has been noticed by many persons accustomed to mountain climbing. The most striking instance that I have seen was during an ascent of Monte Rosa, 15,217 feet. On this occasion the colour was so deep as almost to approach a black, as deep as or deeper than the richest hues of *Gentiana acaulis*. This intensity of colour was only very conspicuous during the last few hundred feet of the ascent; and in expeditions to mountains of nearly the same height I have not often seen it approached, never surpassed. Mr. Hincliff in his "Summer Months among the Alps," p. 111, calls attention to the same phenomenon on Monte Rosa, and very appositely quotes Shelley:

> The sun's unclouded orb
> Rolled through the black concave.

T. G. BONNEY

The Royal Society

I CANNOT but think that the list of candidates recommended by the Council for election into the Royal Society published in your last number will be read by the outside world with considerable surprise. I look in vain in it for the names of two men, at least, of world-wide reputation, and well known as no mere *dilettanti* in their respective sciences, who were among the candidates, while the names of others are found there, which are on everybody's lips with the thought, What have they done to merit the scientific distinction which is looked on by every lover of science as almost an opening of the gates of paradise? Is it possible for us outsiders to learn anything of the considerations which govern the election? NOT AN F.R.S.

The Origin of Species and of Languages

ALTHOUGH the origin of languages is due, doubtless, to the gradual variation, selection, and combination of a few primary sounds, partly emotional, partly imitative; yet the process differs essentially from the Darwinian in one all-important respect—that it is carried on by the countless efforts of *rational* beings. No irrational animal, though capable of uttering emotional sounds that are quite intelligible to its fellows, and though in some instances capable of imitating both natural and articulate sounds in a remarkable degree, has ever formed a language, simply because it wants reason. Therefore the analogy, in so far as it really holds, seems to tell against the Darwinian theory, in as far as that ascribes the origin of species to *reasonless* variation and selection.

To me this seems a most important consideration. But I cannot trespass further on your space.

Stirling WILLIAM TAYLOR

TAUNTON COLLEGE SCHOOL

THE educational scheme which occupied much of the late Lord Taunton's attention during the last years of his life, but of which he only saw the beginning, has now come into practical working. Under ordinary circumstances the development of an ancient Grammar School into a modern Public School would merely pass as one of the now frequent symptoms of advance in English higher education. Thus the removal of Bishop Fox's foundation (A.D. 1522) to a fine range of buildings outside Taunton, would hardly demand notice here. Our readers, however, whose attention was taken by Mr. Tuckwell's paper on Science Teaching in Schools (NATURE, No. 1), will see that the application of his system on a much enlarged scale is likely to affect considerably the position of science in the West of England. While calling public attention to the admirable educational arrangements of this particular school, we wish to remark on science teaching in schools in general, with regard to two points which we observe to be often misconceived by the very teachers and parents whom they especially concern.

First, as to the amount of other work displaced by the introduction of Physical Science as one of the regular parts of the school course. In the mediæval system,

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still not extinct, the forty-two working hours per week were given almost exclusively to classics. In any really good school these hours have now to hold at least an equal average of classical learning, beside English and French, sometimes German, as well as mathematics, geography, history, &c. The problem of doing much in the same time as used to be spent in doing little, is, to a great extent, solved by mere improvement of method. The old classical teaching was so clumsy and repulsive, that its results, so far as it suits the new system to strive for them, may be obtained in one quarter to one half of the time formerly allowed. In addition to this, there are some products of the old system which the new must almost perforce abandon. Latin verses demanded a minimum of ten hours per week out of a total of forty-two working hours. Now, it cannot be too clearly impressed on the minds of persons interested in education, that the time required for giving a well-grounded acquaintance with elementary science is four hours per week.

Second, it is often thought by parents that science, while valuable to boys about to pass certain examinations, or to enter certain professions, is merely of the nature of an "extra accomplishment," not affecting the rest of the educational course. Nothing can be less true. It would be nearer the fact to say that the especial importance of science-teaching in schools, is in its serving beyond any other known means to open children's minds, to stimulate their reasoning powers; not to teach dull formulas, learnt by a *memoria technica*, but to start boys and girls on a course of realising and comprehending life and nature. This statement (as is right with a statement concerning physical science) is one to be tested by direct experiment. Take a class of children brought up to learn Latin and Greek, Geography and History, and Mathematics, but on whose minds the idea has scarcely dawned that these matters concern real places and people and things. Unfortunately, nothing is easier than to find such classes, grinding on, year after year, in the fond belief that, because school work is dull and toilsome, it must be profitable. Now, let an intelligent teacher give these unlucky children an elementary science lesson: for instance, how it is that bodies fall, what causes summer and winter, how the thermometer does its work. In half an hour's time it will be seen in the very faces of the children, that the lesson, independently of its value for itself, has actually repaid the time spent on it, in the newly-aroused attention and reflection it has gained for other studies. It is no exaggeration to say that four hours of really live teaching in science fully pays for itself in the improved quality of the rest of the week. For this cause it is that science is not made optional at the Taunton School. It is taught simply, and with inexpensive apparatus; but every boy is required to collect his own specimens, to perform his own experiments, and to show at every step that he knows what he is doing.

It seems to us that in some few of the really enlightened public schools, such as that we are now writing of, nearly the highest ideal of training has been attained to, compatible with the present habits of English life. When boys, fresh from an intelligent governess at home, or from a ladies' preparatory school of the best sort, go through the full school course from 11 to 17, working steadily on without flagging and without strain or hurry, at an education which they understand to be the direct and purposeful preparation for active business or professional life, such boys start with success in their hands. It is the result of such education that the professional "crammer" tries to simulate when he endeavours to make 12 months' over-work, ruinous to body and mind, produce at the examiners' table the semblance of seven years of steady mental growth. The examiner knows better, and the real business of after-life shows before many years are out the difference between cram and real education.

THE SCIENCE OF EXPLOSIVES AS APPLIED TO WARLIKE PURPOSES

II.—RECENT IMPROVEMENTS IN THE MANIPULATION AND FIRING OF EXPLOSIVE CHARGES

AS we have already shown, the employment of explosive charges is a branch of warfare to which the attention of military engineers has been directed for some time past. For warlike purposes, as also for the destruction of wrecks or other submarine obstructions, explosions have been frequently applied in earlier times, but the methods resorted to for igniting them were, as may be supposed, exceedingly crude and primitive; sometimes a clock-work arrangement was used, sometimes an encased slow match, and, occasionally, explosion was brought about by means of heated shot dropped down a metal tube. As would naturally be inferred, the difficulties and the frequently unsatisfactory results attendant on explosions of this kind rendered their profitable application a matter of considerable doubt, and few successful records of their employment are to be found.

During the past few years our knowledge of the science of explosives has been considerably enlarged. Not only has the subject of igniting charges been studied to such an extent as to form, at the present time, almost a science of itself, but the nature of the combustible material has likewise been changed and improved; and military and naval engineers have thus been placed in possession of a source of power, of which we hardly know whether to admire more its unlimitable force, or its wonderful plasticity.

The first practical application of electricity to igniting gunpowder, although such a proceeding was considered possible both by Franklin and Priestley, was not made until about thirty years ago, when some French military engineers employed a voltaic battery as a means of explosion. The method used by these officers was the simple and well-known one of connecting the two conducting wires by a thin platinum thread, the resistance offered to the passage of the electric current by that metal causing its temperature to be raised to a degree sufficient to ignite any charge of gunpowder in contact with it. This manner of applying the electric current as a source of heat is both simple and practical, but it frequently lacks, besides other qualities, the essential virtues of certainty and instantaneity, and it was for this reason that further investigations of the subject have been from time to time carried on. Among others, Colonel Verdu, a Spanish officer, made some progress in the matter, and was successful by the aid of a Ruhmkorff induction coil in exploding several charges simultaneously. This officer's first attempt was to fire the gunpowder by simply allowing a powerful spark to pass from one pole to the other of two wires imbedded in the charge; he found, however, that ignition in this manner was by no means to be relied upon, but that by covering the poles with fulminate of mercury, a substance more readily inflamed, the desired result was readily secured. Some successful results were also obtained about the same time by employing a particular electric fuze, known as Statham's.

A few years later, in 1856, Sir Charles Wheatstone and Mr. Abel devoted considerable time to the prosecution of further researches, and each of these gentlemen contributed an important discovery, which had the effect of perfecting this interesting application, and rendering it a practical and valuable aid to military science. The employment of electricity induced by magnetism was suggested by Sir Charles, who, after some preliminary experiments, constructed an exploding instrument in which the electricity was created by the rapidly revolving armatures of a compound magnet; and the successful application of this machine was effected through the agency of an electric fuze, devised by Mr. Abel, and of which a sketch is here given.

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